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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/003,121	12/06/2001	Takanobu Takeda	KOJIM-442	5228

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EXAMINER
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LEE, SIN J

ART UNIT	PAPER NUMBER
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1752

DATE MAILED: 10/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/003,121

Applicant(s)

TAKEDA ET AL.

Examiner

Sin J Lee

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 06 December 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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2. Claims 1, 2, and 4-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chiba et al (6,280,900 B1) in view of Yamamoto et al (6,281,318 B1) and Watanabe et al (5,412,050).

Chiba, in his Synthesis Example 2, prepares a copolymer of p-hydroxystyrene and t-butyl acrylate (*this copolymer teaches present formula (2) since present q and p2 can be zeros, present  $R^1$ ,  $R^6$ ,  $R^7$  can all be H atoms, and present  $R^8$  can be a t-butyl group, which is a tertiary alkyl group of 4 carbon atoms*) by radical polymerization using 2,2'-azobisisobutyronitrile as a polymerization initiator. The copolymer has a molecular weight distribution value (Mw/Mn) of 2.4. This copolymer is used in a radiation sensitive resin composition suitable as a resist for ultra-microprocessing utilizing UV radiation, deep UV radiation, X-rays, and charged particle rays (see col.1, lines 7-12).

It is known in the art that an effective way of increasing the resolution of resist materials is to narrow the molecular weight distribution of the polymer used in the resist as evidenced by Watanabe et al, col.1, lines 22-25.

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Also, Yamamoto et al teaches (col.3, lines 46-50 and col.4, lines 38-43) that polymer which does not have a narrow molecular weight distribution is not proper to be used for chemical amplification type positive resist materials in which a high resolution is required, and thus Yamamoto teaches (see col.5, lines 36-45 and col.17, lines 39-62) a method of making poly{4-(1-methylethenyl)phenol} (see the chemical structure in col.17, lines 45-55) having a narrow molecular weight distribution value of 1.0 to 1.5. For example, Yamamoto first synthesizes poly[1-(1-ethoxyethoxy)-4-(1-methylethenyl)benzene] by *anionic-polymerization* of 1-(1-ethoxyethoxy)-4-(1-methylethenyl)benzene. Then, Yamamoto brings this polymer into contact with a protonic acid (e.g., 35% aqueous hydrochloric acid solution) in the presence of an organic solvent to carry out an *ethoxyethoxy group eliminating reaction* in order to form the final product, poly{4-(1-methylethenyl)phenol} (*which is the other name for poly(p-hydroxy- $\alpha$ -methyl styrene*), which has the molecular weight distribution value of 1.02. See col.6, lines 63-67, col.7, lines 1-21, col.8, lines 27-65, col.9, lines 38-43, and Example 1.

Yamamoto's 4-(1-methylethenyl)phenol repeating unit (see col.17, lines 45-55) in his poly{4-(1-methylethenyl)phenol} is almost the same in its chemical structure as the p-hydroxystyrene repeating unit in Chiba's copolymer of p-hydroxystyrene and t-butyl acrylate. Therefore, based on Yamamoto's teaching, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art to apply Yamamoto's teaching in making Chiba's copolymer of p-hydroxystyrene and t-butyl acrylate, i.e., first synthesize copolymer of p-1-ethoxyethoxystyrene and t-butylacrylate (*this copolymer*

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*teaches present formula (1) of claim 1 because present q can be zero, R<sup>1</sup> can be H atom, R<sup>3</sup> can be an ethyl group, R<sup>2</sup> can be a methyl group, R<sup>7</sup> can be a H atom, and R<sup>8</sup> can be a t-butyl group) by anionic polymerization of p-1-ethoxyethoxystyrene and t-butyl acrylate (in fact, Chiba states in col.6, lines 42-45 that his copolymers can be produced by anionic polymerization as well as radical polymerization) and then bring this copolymer into contact with a protonic acid in the presence of an organic solvent to carry out an ethoxyethoxy group eliminating reaction to form the final product, copolymer of p-hydroxystyrene and t-butyl acrylate, with a reasonable expectation of obtaining the copolymer of p-hydroxystyrene and t-butyl acrylate having a very narrow molecular weight distribution value and thus obtaining a high resolution-resist material. Therefore, Chiba in view of Yamamoto et al and Watanabe et al would render obvious present inventions of claims 1 and 2.*

In addition to the copolymer of p-hydroxystyrene and t-butyl acrylate, Chiba's photoresist composition also contains a photoacid generator, a basic substance (as an acid diffusion controller), a dissolution controller, and a solvent (see col.7, lines 5-10, col.10, lines 14-24, col.13, lines 35-39, col.16, lines 47-52). Therefore, Chiba in view of Yamamoto et al and Watanabe et al would render obvious present inventions of claims 4-7.

3. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al (6,143,460) in view of Chiba et al (6,280,900 B1), Yamamoto et al (6,281,318 B1), and Watanabe et al (5,412,050).

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Kobayashi teaches (see col.30, lines 35-61) a resin in which 25 mol% of H atoms of *phenolic hydroxyl groups* in 4-hydroxystyrene/t-butyl acrylate copolymer (*this copolymer teaches present formula (2) since present q and p2 can be zeros, present  $R^1$ ,  $R^6$ ,  $R^7$  can all be H atoms, and present  $R^8$  can be a t-butyl group, which is a tertiary alkyl group of 4 carbon atoms*) is replaced by an *acid labile group* (such as 1-ethoxyethyl groups, 1-ethoxypropyl groups, t-butoxycarbonyl groups, t-butyl groups or 1-cyclohexyloxyethyl groups). Although the prior art does not teach how it made the starting material, 4-hydroxystyrene/t-butyl acrylate copolymer, this copolymer is usually made by radical copolymerization of 4-hydroxystyrene and t-butyl acrylate in the presence of polymerization initiator as evidenced by Chiba et al (see the discussion in Paragraph 2 above). As discussed above, Chiba's copolymer of p-hydroxystyrene and t-butyl acrylate formed by radical polymerization using 2,2'-azobisisobutyronitrile as a polymerization initiator yielded the molecular weight distribution value ( $M_w/M_n$ ) of 2.4. As discussed above, both Watanabe and Yamamoto teaches that an effective way of increasing the resolution of resist materials is to narrow the molecular weight distribution of the polymer used in the resist. Furthermore, Yamamoto teaches a method of making poly{4-(1-methylethenyl)phenol} having a narrow molecular weight distribution value of 1.0 to 1.5. For example, Yamamoto first synthesizes poly[1-(1-ethoxyethoxy)-4-(1-methylethenyl)benzene] by *anionic polymerization* of 1-(1-ethoxyethoxy)-4-(1-methylethenyl)benzene. Then, Yamamoto brings this polymer into contact with a protonic acid (e.g., 35% aqueous hydrochloric acid solution) in the presence of an organic solvent to carry out an *ethoxyethoxy group eliminating reaction* in order to form

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the final product, poly{4-(1-methylethenyl)phenol} (*which is the other name for poly(p-hydroxy- $\alpha$ -methyl styrene*), which has the molecular weight distribution value of 1.02 .

See the discussion in Paragraph 2. Yamamoto's 4-(1-methylethenyl)phenol repeating unit (see col.17, lines 45-55) in his poly{4-(1-methylethenyl)phenol} is almost the same in its chemical structure as the 4-hydroxystyrene repeating unit in Kobayashi's copolymer of 4-hydroxystyrene and t-butyl acrylate. Therefore, based on Yamamoto's teaching, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art to apply Yamamoto's teaching in making Kobayashi's copolymer of 4-hydroxystyrene and t-butyl acrylate, i.e., first synthesize copolymer of 4-1-ethoxyethoxystyrene and t-butylacrylate by anionic polymerization of 4-1-ethoxyethoxystyrene and t-butyl acrylate and then bring this copolymer into contact with a protonic acid in the presence of an organic solvent to carry out an ethoxyethoxy group eliminating reaction to form the final product, copolymer of 4-hydroxystyrene and t-butyl acrylate, with a reasonable expectation of obtaining the copolymer of 4-hydroxystyrene and t-butyl acrylate having a very narrow molecular weight distribution value and thus obtaining a high resolution-resist material. Therefore, Kobayashi in view of Chiba, Yamamoto et al, and Watanabe et al would render obvious present "polymer comprising recurring units of formula (2) prepared by the method of claim 1" as recited in present claim 3.

Kobayashi's resin, in which 25 mol% of H atoms of *phenolic hydroxyl groups* in 4-hydroxystyrene/t-butyl acrylate copolymer is replaced by an *acid labile group*, teaches present formula (2') because in the present formula, q and p2 can be zeros, R<sup>1</sup> can be a

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H atom, R<sup>7</sup> can be a H atom, R<sup>8</sup> can be a t-butyl group, and R<sup>0</sup> is an acid labile group.

Therefore, Kobayashi in view of Chiba, Yamamoto et al, and Watanabe et al would render obvious present invention of claim 3.

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is (703) 305-0504. The examiner can normally be reached on Monday-Friday from 8:30 am EST to 5:00 pm EST.

----- If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ms. Janet Baxter, can be reached on (703) 308-2303. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9311 for after final responses or (703) 872-9310 for before final responses.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-0661.

*S. J. Lee*

S. Lee  
9/29/03

*[Signature]*  
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